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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/944,499	08/30/2001	Salman Akram	3936.IUS (99-0066.1)	4371

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EXAMINER

CHAMBLISS, ALONZO

ART UNIT

PAPER NUMBER

2827

DATE MAILED: 07/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/944,499	Applicant(s) AKRAM ET AL.	
	Examiner Alonzo Chambliss	Art Unit 2827	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 4/14/03 (amendment B).
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 14 April 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>11,13</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Amendment B filed on 4/14/03 has been fully considered and made of record in Paper No. 12.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 031/21/03 in Paper No. 11 and 5/28/03 in Paper No. 13 was filed after the mailing date of the non-final rejection filed on 1/8/. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

3. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 4/14/03 has been approved by the examiner. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Response to Arguments

4. Applicant's arguments filed on 4/14/03 have been fully considered but they are not persuasive.

Applicant alleges that Kaniaki fails to expressly or inherently describe that any of the support projections of the semiconductor element 3 thereof is "positioned between a

periphery of active surface and each contact pad exposed to active surface thereof.

The examiner agrees with the applicant. However, the new rejection relies upon Watanabe to disclose this limitation.

Applicant alleges that Kaniaki fails to expressly or inherently description that any of the support projections 12 thereof. The examiner agrees with the applicant. However, the new rejection relies upon Watanabe to disclose this limitation.

Applicant alleges that Watanabe fails to disclose all of the contact pads of the substrate are arranged in-line with other contact pads thereof and are positioned proximate to a centerline of the substrate. This agreement is deemed to be unpersuasive because Watanabe that each contact pad 5 of the substrate 4 being substantially in line with at least one other contact pad 5 and positioned proximate (i.e. **close or very near**) to a centerline of the substrate 4 (see Fig. 2).

Applicant alleges that Kaniaki and Blanton lack any teaching or suggestion of a semiconductor device component, which includes at least one stabilizer that includes a plurality of, superimposed, contiguous, mutually adhered layers, each of which comprises dielectric material. The examiner agrees with the applicant. However, the new rejection relies upon Farnworh to disclose this limitation.

Applicant alleges that Watanabe nor Blanton teaches or suggests a semiconductor device component which includes at least one stabilizer which is elongated in a direction parallel to active surface of a substrate thereof. This agreement is deemed to be unpersuasive because Blanton discloses at least one stabilizer having

an elongated (i.e. rectangular shape) to the active surface (see col. 6 lines 1-9; Figs. 1 and 3).

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 3-5, 7-11, 31, and 32, insofar as definite, are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Watanabe (JP 58-157146).

With respect to Claims 1, 31, and 32, Watanabe teaches a substrate 4 having an active surface with contact pads 5 exposed thereto, the contact pads 5 being configured to be connected with conductors 3 on a first surface of another semiconductor device 1. Each contact pad 5 of the substrate 4 being substantially in line with at least one other contact pad 5 and positioned proximate (i.e. close) to a centerline of the substrate 4. At least one stabilizer 6 protruding from the active surface and positioned between a periphery of the active surface and the contact pads 5. The stabilizer 6 is fabricated directly on the active surface of the substrate 4. The stabilizer 6 is preformed separately from the substrate 4 and subsequently attached to the active surface of the substrate 4 and each contact pad exposed to the active surface (see English abstract and all figures).

With respect to Claim 3, Watanabe teaches wherein the at least one stabilizer 6 protrudes from the active surface a distance that permits conductive structures 3 on the contact pads 5 to contact the conductors 2 of the another semiconductor device 1 (see Fig. 1).

With respect to Claims 4 and 5, Watanabe teaches wherein the at least one stabilizer 6 comprises a dielectric photocurable material (see English abstract).

With respect to Claim 7, Watanabe teaches wherein the at least one stabilizer 6 is positioned proximate a corner of the active surface 4a (see Figs. 1, 3-6).

With respect to Claim 8, Watanabe teaches wherein the at least one stabilizer 6 has a cross-sectional round shape (see Fig. 2).

With respect to Claim 9, Watanabe teaches at least one stabilizer 6 is elongated in a direction parallel to the active surface (see Fig. 1).

With respect to Claim 10, Watanabe teaches further comprising protruding conductive structures 3 in contact with selected ones of the contact pads 5 (see Fig. 1).

With respect to Claims 11, Watanabe teaches wherein the conductive structures 5 comprise of conductive columns (see Fig. 1).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention

was made. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 2 and 25-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe (JP 58-157146) as applied to claim 1 above, and further in view of Kuniaki et al. (JP 10-189653).

With respect to Claim 2, Watanabe discloses at least one stabilizer protruding a distance from the active surface that allows conductive structures 3 to connect to chip 1 (see Fig. 1). Thus, one skilled in the art at the time of the invention would readily recognize that the initial height of the stabilizer from the active surface would be no more than a distance than that of the conductive structure when disposed in contact with at least one of the contact pads, since the height of the stabilizer would have to be smaller in height to compensate when the conductive structure decreases in height after reflow to connect the substrate to the chip. Therefore, one skilled in the art would readily recognize having at least one stabilizer protruding from the active surface a distance no more than a distance that at least one conductive structure to be disposed in contact with at least one of the contact pads while the contact pads extends beyond the active surface, since the height of the stabilizer would have to be smaller in height to compensate when the conductive structure decreases in height after reflow to connect the substrate to the chip.

With respect to Claim 25, Watanabe discloses all of the claimed invention except for at least one stabilizer configured to allow an insulative underfill material to flow into a

space created when the substrate is connected with another semiconductor device. However, Kuniaki discloses at least one stabilizer 12 configured to allow an insulative underfill material 15 to flow into a space created when the substrate 2 is connected with another semiconductor device 1 (see Fig. 2). Therefore, it would have been obvious to incorporate the underfill material with the device of Watanabe, since the underfill material would reinforce the solder ball connection (i.e. conductive structures) between the substrate and the chip as taught by Kuniaki.

With respect to Claim 26, Kuniaki teaches wherein said at least one stabilizer 12 is configured so that voids do not occur in said insulative underfill material 15 when the insulative underfill material 15 is flowed into the space created when the substrate 2 is connected with the semiconductor device 3, since if voids were present in the insulative underfill material 15, the underfill material would not reinforce the solder connection (see English translation, paragraph 24; Fig. 14).

With respect to Claim 27, Watanabe discloses at least one stabilizer protruding a distance from the active surface that allows conductive structures 3 to connect to chip 1 (see Fig. 1). Thus, one skilled in the art at the time of the invention would readily recognize that the initial height of the stabilizer from the active surface would be no more than a distance than that of the conductive structure when disposed in contact with at least one of the contact pads, since the height of the stabilizer would have to be smaller in height to compensate when the conductive structure decreases in height after reflow to connect the substrate to the chip. Therefore, one skilled in the art would readily recognize having at least one stabilizer protruding from the active surface a

distance no more than a distance that at least one conductive structure to be disposed in contact with at least one of the contact pads while the contact pads extends beyond the active surface, since the height of the stabilizer would have to be smaller in height to compensate when the conductive structure decreases in height after reflow to connect the substrate to the chip.

With respect to Claim 28, Watanabe teaches wherein the at least one stabilizer 6 protrudes from the active surface a distance that permits conductive structures 3 on the contact pads 5 to contact the conductors 2 of the another semiconductor device 1 (see Fig. 1).

With respect to Claims 29 and 30, Watanabe teaches wherein the at least one stabilizer 6 comprises a dielectric photocurable material (see English abstract).

9. Claims 6, 13-19, and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe (JP 58-157146) as applied to claims 1 and 5, above, and further in view of Farnworth (U.S. 5,484,314) and Sato (U.S. 6,287,895).

With respect to Claims 6, 13, 16, and 17, Watanabe fails to disclose a stabilizer with a plurality of superimposed, contiguous, mutually adhered layers. However, Farnworth discloses a stabilizer 18 (i.e. spacer) made of resin with a plurality of superimposed, contiguous, mutually adhered layers, each of which comprises dielectric material (see col. 4 lines 1-45). Therefore, it would have been obvious to incorporate the plurality of adhered layers with the device of Watanabe, since the plurality of

adhered layers would reduce the flexible and deformation of the spacer by hardening the layers one at a time until the uppermost layer is finally hardened as taught by Farnworth.

With respect to Claims 12 and 23, it is well known in the semiconductor industry that a substrate comprises a semiconductor wafer with a plurality of dice thereon as evident by Sato (see col. 5 lines 16-39; Figs. 5, 6A, and 6B).

With respect to Claim 14, Watanabe discloses at least one stabilizer protruding a distance from the active surface that allows conductive structures 3 to connect to chip 1 (see Fig. 1). Thus, one skilled in the art at the time of the invention would readily recognize that the initial height of the stabilizer from the active surface would be no more than a distance than that of the conductive structure when disposed in contact with at least one of the contact pads, since the height of the stabilizer would have to be smaller in height to compensate when the conductive structure decreases in height after reflow to connect the substrate to the chip. Therefore, one skilled in the art would readily recognize having at least one stabilizer protruding from the active surface a distance no more than a distance that at least one conductive structure to be disposed in contact with at least one of the contact pads while the contact pads extends beyond the active surface, since the height of the stabilizer would have to be smaller in height to compensate when the conductive structure decreases in height after reflow to connect the substrate to the chip.

With respect to Claim 15, Watanabe discloses wherein the at least one stabilizer 6 protrudes from the active surface a distance that permits conductive structures 3 on

the contact pads 5 to contact the conductors 2 of the another semiconductor device 1 (see Fig. 1).

With respect to Claims 16 and 17, Watanabe teaches wherein the at least one stabilizer 6 comprises a dielectric photocurable material (see English abstract).

With respect to Claim 18, Watanabe discloses wherein the at least one stabilizer 6 is positioned proximate a corner of the active surface 4a (see Figs. 1, 3-6).

With respect to Claim 19, Watanabe discloses at least one stabilizer having an round cross-sectional shape (see Fig. 2).

With respect to Claim 21, Watanabe discloses further comprising protruding conductive structures 3 in contact with selected ones of the contact pads 5 (see Fig. 1).

With respect to Claims 22, Watanabe discloses wherein the conductive structures 5 comprise of conductive columns (see Fig. 1).

With respect to Claim 24, Blanton discloses wherein the at least one stabilizer 40a-40f maintains a substantially uniform distance between the active surface 32 and the first surface of the semiconductor device 10 (see Fig. 3).

10. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe (JP 58-157146) as applied to claim 13, above, and further in view of Blanton (U.S. 5,220,200).

With respect to Claim 20, Watanabe fails to disclose at least one stabilizer that is elongated in a direction parallel to the active surface. However, Blanton discloses at least one stabilizer 50 that is elongated (i.e. rectangular shape) in a direction parallel to the active surface (see col. 6 lines 1-9; Figs. 1 and 3). Therefore, it would have been

obvious to one skilled in the art at the time of the invention to incorporate an elongated stabilizer, since the elongated stabilizer would be in contact with a larger surface area on the semiconductor chip and the substrate to further improve the stability of the overall semiconductor package.

The prior art made of record and not relied upon is cited primarily to show the product of the instant invention.

Conclusion


11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning the communication or earlier communications from the examiner should be directed to Alonzo Chambliss whose telephone number is (703) 306-9143. The fax phone number for this Group is (703) 308-7722 or 7724.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-7956.

AC/July 13, 2003



Alonzo Chambliss
Patent Examiner
Art Unit 2827